

Correction and compensation of acid-base balance disorders

If, for any reason, the ABR malfunction occurs, the organism begins to make efforts to maintain the pH of the internal environment. In essence, ABR fights the original disorder with another disorder that shifts the pH in the opposite direction. We distinguish two groups of such mechanisms:

Compensation

It means that with a metabolic disorder, the pH of the internal environment is maintained by changing respiration. For example, metabolic acidosis is compensated by respiratory alkalosis; the patient will take labored deep breaths ("Kussmaul breathing").

Correction

- We only talk about correction in the case of ABR metabolic disorders: one metabolic deviation is corrected by another. E.g. a patient with liver failure (and thus with metabolic alkalosis) will excrete more bicarbonate through the kidneys and acidify the urine less.

Corrective and compensatory mechanisms take time to develop. A change in respiration occurs almost immediately after the occurrence of an ABR disturbance. Respiratory compensatory mechanisms then deepen, reaching a maximum in about 12–24 hours. Compensation and correction at the level of the kidneys is much slower - because some transport mechanisms have to be reregulated, which often requires protein synthesis. These mechanisms reach their maximum in five days.

When arriving at high altitudes, acclimatization takes about five days. The cause of altitude sickness is hyperventilation, which the body tries to counter hypoxia. However, strenuous breathing will not improve hemoglobin saturation with oxygen much - the partial pressure of O_2 in the surrounding atmosphere is too low for this, but it leads to respiratory alkalosis. It is alkalosis and ionic imbalance that is the cause of the manifestations of altitude sickness, including brain swelling, lung swelling and tachycardia. Acclimatization consists in over-regulation of the kidneys - essentially in the development of metabolic acidosis, which lasts the mentioned 5 days. It can be accelerated by taking in a large amount of fluids, as the loss of bicarbonates into the urine will increase. As part of the treatment of altitude sickness, the administration of acetazolamide - a carbonic anhydrase inhibitor, which reduces the acidification of the urine - is sometimes recommended (however, more recent work considers the administration of acetazolamide to be of little effectiveness).

Links

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